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Innovation Management in Iberdrola

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Abstract

Innovation is Iberdrola's main tool to guarantee its sustainability, efficiency and competitiveness. The model in Iberdrola is decentralised because the process is carried out independently in each Business Unit with support and coordination from the Innovation Department and open innovation because it seeks to involve Group technology suppliers such as universities, technology centres and equipment manufacturers in the innovation process. Research, Development and Innovation efforts comprise three main components: Efficiency: optimising operations, managing the life of facilities and equipment, bringing down operating and maintenance costs and reducing the environmental impact. New products and services to meet customer needs through digitalisation, automation and tailored solutions. Disruptive technologies and business models to tackle future energy challenges. The Company has organised its R&D Management System so that the Innovation Department can provide the Business Units with a global model, since we believe that there should be a single, standard and systematic innovation process for the entire organisation. Thanks to the commitment with Innovation, Iberdrola has positioned as a world leader in the offshore area, where it develops the most advanced and innovative projects. Wikinger Offshore wind farm is an emblematic project for Iberdrola, the symbol of Iberdrola's commitment to innovation, sustainability and internationalisation.

Keywords: open innovation, smart grids, offshore, R&D, technology, management system, digitalisation

1. Summary

In anticipation of the energy transition, Iberdrola has committed to sustainable solutions that require greater electrification of the global economy: more clean energy, more storage capacity, more backup power, more and smarter grids, and more digitization, being innovation a strategic variable that constitutes the main tool for guaranteeing the sustainability, efficiency and competitiveness of the company.

The innovation model in Iberdrola is decentralised because the process is carried out independently in each business unit with and open because it seeks to involve group technology suppliers such as universities, technology centres and equipment manufacturers in the innovation process. The R&D&i (research, development and innovation) efforts comprise three main components:

- Efficiency: continuously optimising operations, managing the life of facilities and equipment, reducing operating and maintenance costs and the environmental impact.
- New products and services to meet customer needs through digitalisation, automation and tailored solutions.
- Disruptive technologies and business models to tackle future energy challenges.

Thanks to the commitment with Innovation, sustainability and internationalisation, Iberdrola has positioned as a world-wide leader in the offshore area, where it develops the most advanced and innovative projects.

The Wikingen offshore wind farm is an emblematic project for Iberdrola. This project has materialised in a fusion of the company's resolute dedication to renewable energies with technological innovation, internationalisation and a contribution to the economic development with job creation in regions where the group is present. Moreover, through our international expansion, Iberdrola opens the door for its suppliers and service providers to new markets and business.

2. Introduction

Boasting a track record that spans over 170 years, currently Iberdrola is a multinational group leading the energy sector: the company produces and supplies electricity to some 100 million people in the countries in which it operates. Furthermore, the company has become the leader in clean energy — Iberdrola is the first renewable producer among European utilities and the cleanest power company in the USA, with almost zero emissions —, it is pioneering the rollout of smart grids and has an energy storage capacity in excess of 4 GW.

Iberdrola reached its current position as a result of the transformation undertaken by the company over the past 15 years and thanks to a corporate advantage point capable of anticipating sector trends: acknowledgement that the intensely growing world energy demand cannot be satisfied with an inefficient and unsustainable model for the environment based on fossil fuels. On the contrary, the shift towards a gradual decarbonisation of the economy, increase in the importance of electricity in the universal energy balance and growth of clean energies was relentless and irreversible.

In anticipation of the energy transition, Iberdrola has committed to sustainable solutions that require greater electrification of the global economy: more clean energy, more storage capacity, more backup power, more and smarter grids and more digitisation.

Iberdrola is tackling the outlook for the immediate future in a scenario characterised by a sharp growth in the global energy demand from efficient, clean sources to cut global emissions and combat climate change [1].

As a result of our permanent commitment to human, economic and management-centred innovation, Iberdrola has been recognised as the most innovative power utility in Spain and third in Europe according to the European Commission's ranking [2].

3. Innovation strategy

3.1. R&D&i Management System

At Iberdrola, we strongly believe that the current paradigm can continue advancing and we can move forward towards the far-reaching transformation envisioned for the energy section by continuously improvement and attaining greater efficiency in our processes and operations. Now, more than ever, we need to bolster innovation to turn it into the main implement in our search for the new opportunities that will enable us to progress towards a flexible, cheaper, balanced, more sustainable and less polluting energy model, while also creating jobs.

Innovation is a strategic variable that constitutes the main tool for guaranteeing the sustainability, efficiency and competitiveness of the company. Our efforts in R&D&i aim to optimise operating conditions, improve safety and reduce the environmental impact of our activities.

Iberdrola is aware that innovation requires planning to ensure that all the R&D&i activities of all the businesses in the Group are coordinated and structured. For this reason, an R&D&i Management System was implemented in mid-2007 thus providing systematised and standardised criteria for R&D&i activities that can be implemented globally and efficiently.

Iberdrola has structured its R&D&i Management System so that the Innovation Division can provide business units (Generation, Networks, Renewables, IT and Engineering) with a global model, since we believe that there should be a single, standard and systematic innovation process for the entire organisation. The development of a specific structure for this management, such as R&D&i committees, has been fundamental for managing the innovative process from a perspective that is closer to them. Each business or company has an R&D coordinator and an R&D manager [1] (see **Figure 1**).

- **R&D Coordinators Committee**, which is carried out annually and is presided by the Innovation Director and attended by the R&D coordinators of each Business.
- **Business R&D Committee**, which is held twice a year for each Business and coordinated by the Business R&D Coordinator, including the Innovation Director, the Business Innovation Manager, as well as experts depending on the issues (i.e. project managers) and the R&D Management System Coordinator if it is necessary.

In short, the R&D&i Management System enables us to view innovation as a basic activity of a consistently and effectively managed organisation, according to a set of well-defined and well-documented processes with owners assigned to the various activities and a proper allocation of resources. The chart below shows the international process map for R&D&i management across the Iberdrola Group [1] (see **Figure 2**).

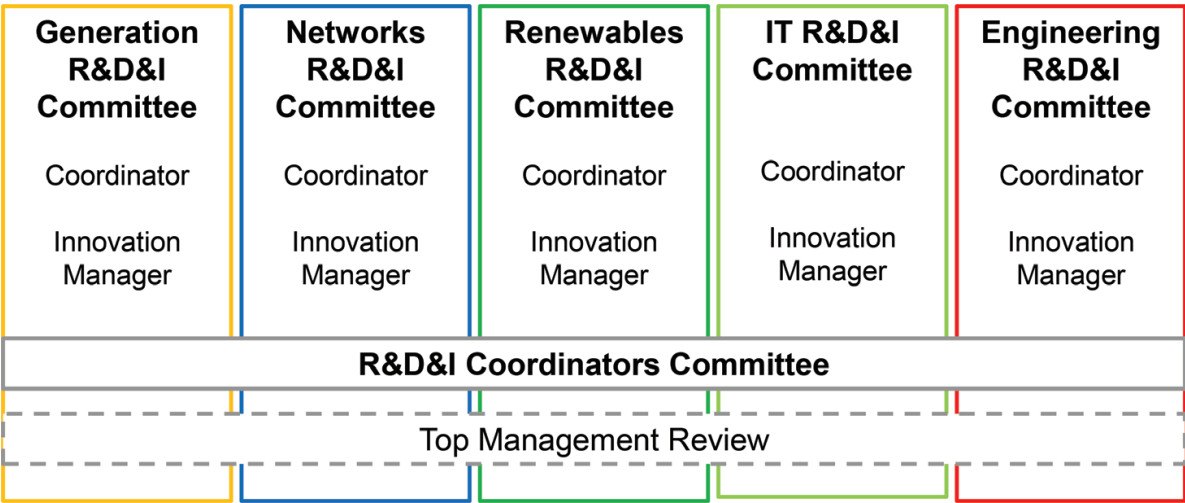


Figure 1. R&D organisation model.

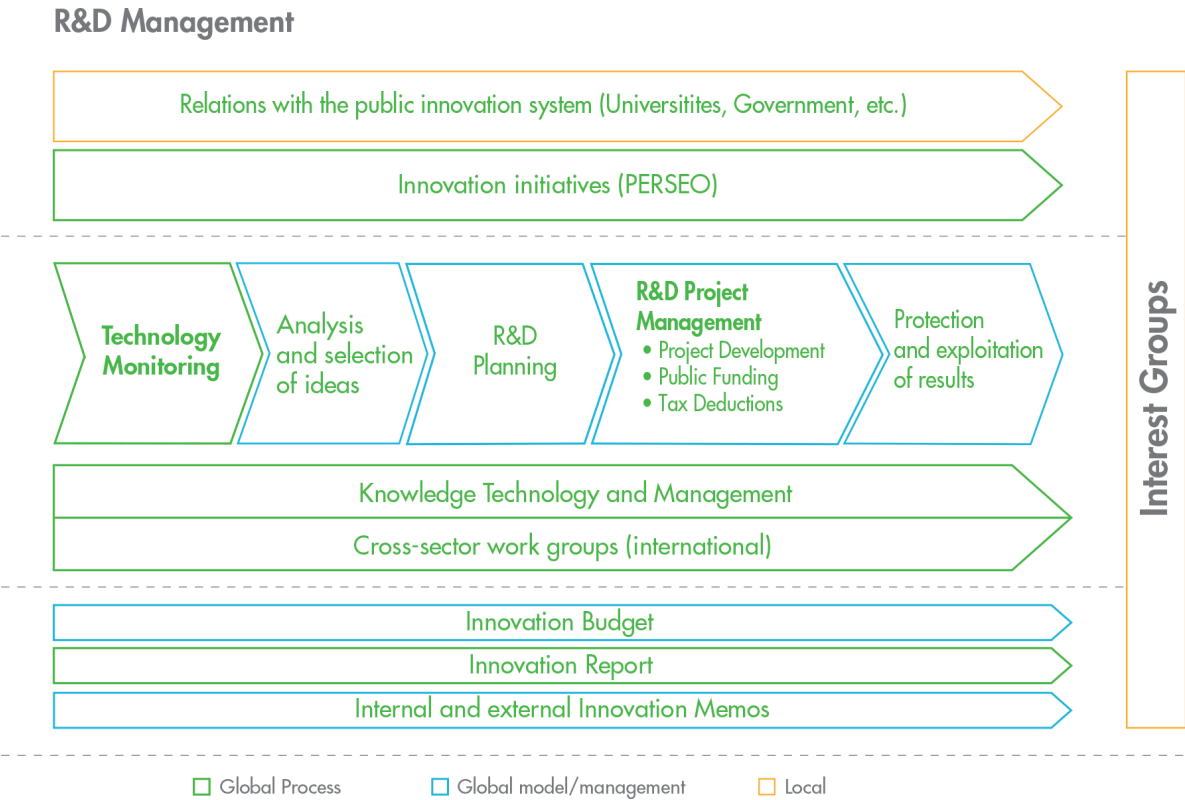


Figure 2. R&D&i Management System.

Iberdrola understands innovation as a decentralised and open process:

- *Decentralised*, because the process is carried out independently in each business unit with the support and coordination of the Innovation Division.
- *Open*, because Iberdrola prides itself on being a technology-driven company and, as such, seeks to involve Group technology suppliers, such as universities, technology centres and equipment manufacturers in the innovation process.

The chart below shows the different internal and external agents that form part of Innovation at Iberdrola on a day-to-day basis [1] (see **Figure 3**):

- *The innovation division*: Rigorously and efficiently managing the Iberdrola Group's innovation capabilities, providing the Group with the tools, resources and structures necessary for creating a suitable environment for cultivating innovation.
- *R&D&i coordinator committee*: Responsible for innovation at the Iberdrola Business Units, sharing best practices at an executive level and monitoring compliance with the R&D&i Plan.
- *Business units*: As a fundamental part of the decentralised innovation model, business units conduct R&D&i activities and projects. The Innovation Committees have been set up as a support and management structure. The work of our Innovation Coordinators is highly relevant at a management level, while the Innovation Manager provides support to all R&D&i promotion activities.
- *Support for innovation*: Internal areas at Iberdrola for fostering innovation.
- *Special initiatives*: Iberdrola Corporate University, Spanish Iberdrola Foundation and Iberdrola Ventures-PERSEO (corporate venture capital programme).
- *Value chain*: The company's stakeholders, clients, manufacturers and external partners.
- *R&D&i system*: Universities and technological centres, government agencies.

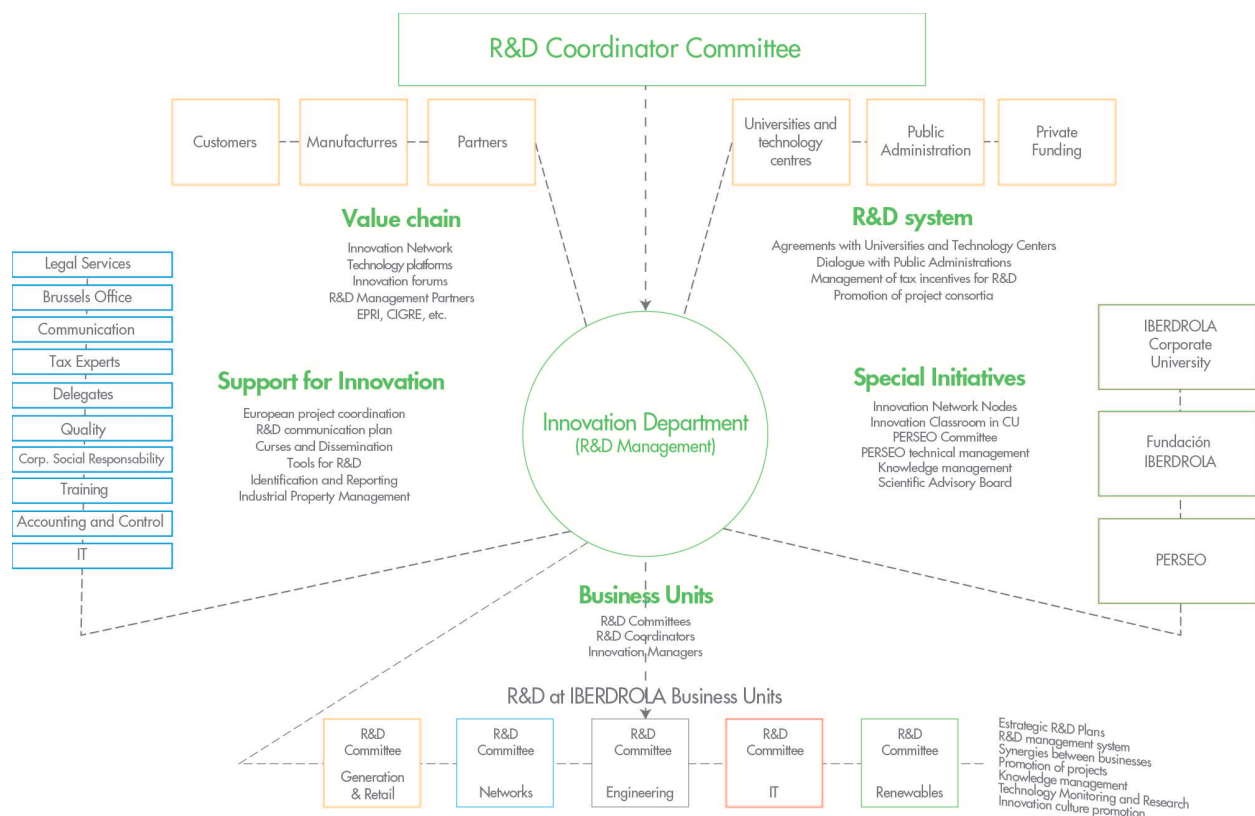


Figure 3. Internal and external agents.

3.2. Open innovation

Open innovation represents the management of collaboration contributing to maintain and renew structures for innovation and is essential for large collaborative groups as is the case of Iberdrola, with 30,000 employees in 40 countries. This management provides a forum for communication with the Group and the right tools to ensure that collaboration is successful and objectives are met.

This open innovation model entails partnerships with companies, universities, technology centres, industrial organisations and public institutions through different programmes and agreements.

In this line, Iberdrola launched its **Supplier Innovation Programme** for promoting and accelerating the development of new products and services that provide solutions to the future needs of the company while responding to the challenges facing the sector.

The programme revolves around three central axes: facilitating access to financing mechanisms, fostering the joint creation of companies (spin-offs with suppliers) and favouring innovative acquisitions from small and medium-sized enterprises.

The Ministry of the Economy and Competitiveness and Iberdrola will share good practices in innovative acquisition procedures, fostering innovation from the demand side and opportunities for co-investments within the framework of the INNVIERTE programme, which aims to promote innovation in entrepreneurship through support to the venture capital investment in innovative technology-based entrepreneurs [2].

This initiative will boost the pull effect that IBERDROLA exerts on the business sector in the areas where it has operations.

In addition, Iberdrola has launched a new initiative, **IBERDROLA Universitas**, to boost special partnerships with the world of academia and science in order to:

- Promoting University-Business technology transfer.
- Establishing a framework for collaboration for the launch of R&D&i projects and training initiatives in common areas of interest.
- Promoting specialised training in the fields of greatest interest to Iberdrola.
- Materialising social commitment.

3.3. Iberdrola innovation plan

The deployment of innovative strategy both in management and technology has converted Iberdrola into the world leader and benchmark in R&D&i, as a result of the successful implementation of a common model for all geographic and technological areas, collaboration with technology providers and the fostering of a culture of innovation.

The Iberdrola R&D&i Plan consolidates the research, development and innovation plans of the different Business Units during this period. In line with the Group's outlook, the Plan reinforces the commitment to sustainable development, promotion of renewable energy sources and emerging technologies along three lines of action [1–3]:

- *Efficiency*, focused on continuous optimisation of our operations, facilities and materials management, operations and maintenance cost reductions and reduction in environmental impact. Thanks to the participation of all employees in Iberdrola Group, there are more than 200 R&D projects that are developing with an impact on the business in the short- and medium-term.
- *New products and services* that respond to the needs of customers in a market that is increasingly global and competitive. These are projects that employing existing technology become business models which offer the most efficient and environmentally respectful supply of electricity, equipment and technologies. These include projects highlighting electrical efficiency, electric vehicles, digitisation, smart grids and distributed generation resources.



Figure 4. R&D&i in generation.

- *Disruptive technologies and business models* that allow us to face the energy challenges of the future. Through PERSEO, Iberdrola’s corporate venture capital programme, we invest in disruptive technologies and new businesses that ensure the sustainability of the energy model.

The project portfolio for Research, Development and Innovation (R&D&i) at Iberdrola comprises activities in four main areas, reflecting the company’s strong commitment to sustainable development and the promotion of emerging technologies [1]:

- *Sustainable generation and retail*: The efforts in the generation and retail area focus on flexibility and operating efficiency, with respect to the environment and the improvement of facility safety based on two main areas: clean generation and energy efficiency (see **Figure 4**).
- *Networks for the future*: Smart grid is a technological evolution of the energy distribution system that combines traditional facilities with modern monitoring technologies, and information and telecommunication systems. Iberdrola hones its efforts in innovation on

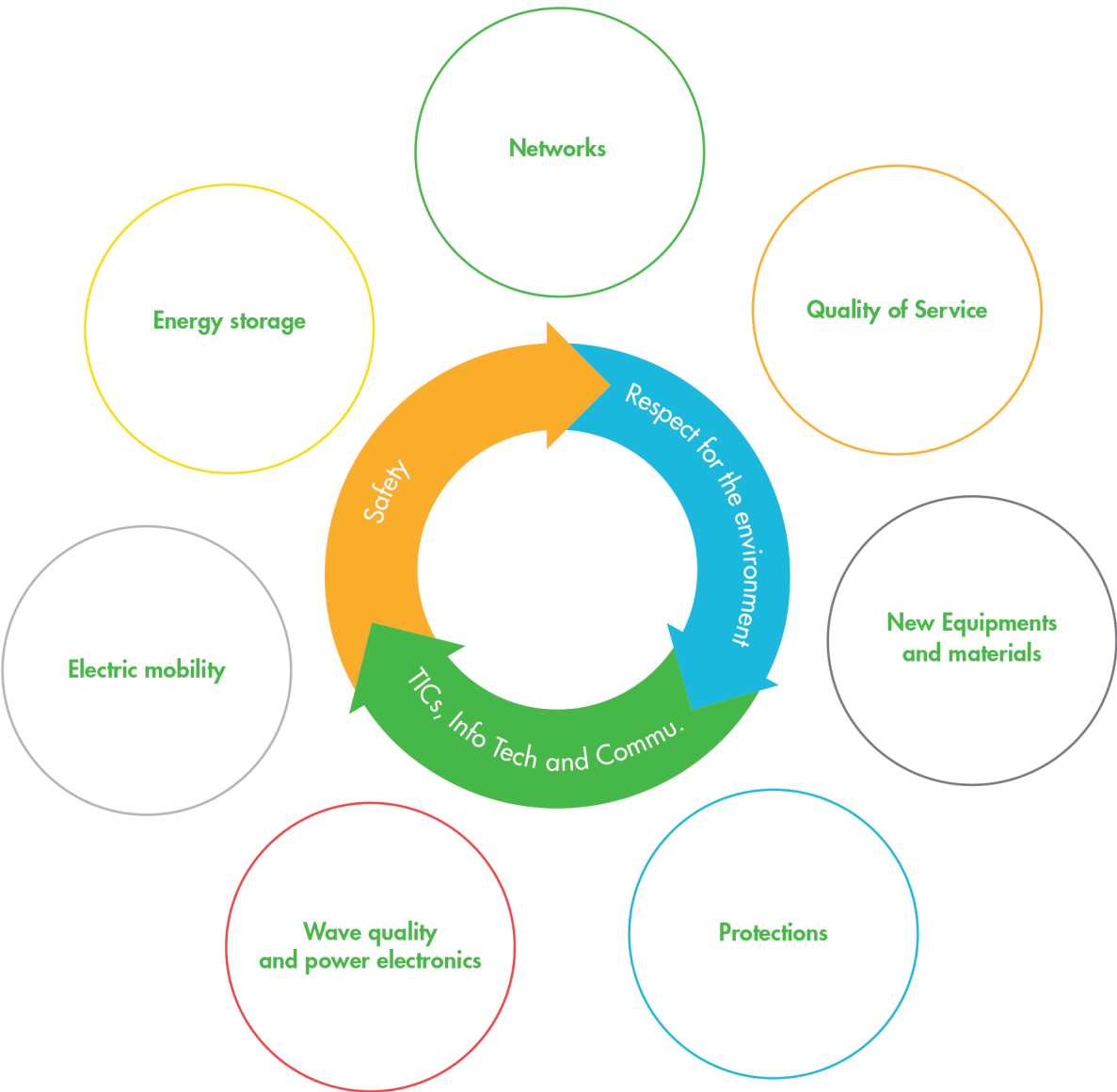


Figure 5. R&D&i in networks.

the grids area to offer a broader range of services to customers, improve supply quality, respond to society's future demand for electricity and achieve optimal power distribution management (see **Figure 5**).

- *Renewable energy sources:* Innovation activities in the area of renewables have mostly focused on improving the efficiency of operational assets, the integration of renewable energies and the development of new designs or processes for projects in the pipeline or future projects mainly associated with offshore wind power and other renewable technologies (see **Figure 6**).
- *Cross-sector technologies:* These activities are related to information and communications technologies (ICT), digitisation, engineering and other cross-cutting areas such as electric vehicles, energy storage, environmental performance and energy efficiency, security, etc.



Figure 6. R&D&i in renewables.

4. Example of success: Wikinger offshore wind farm project

The Company has become a global benchmark in the offshore sector, where it carries out the most cutting edge and innovative projects. Innovation in offshore wind power projects is fundamental in order to reduce costs and limit the risks in projects in the pipeline and future projects [4].

Wikinger offshore wind farm is an emblematic project for Iberdrola, the symbol of Iberdrola's commitment to innovation, sustainability and internationalisation.

This project has materialised in a fusion of the company's resolute dedication to renewable energies with technological innovation, internationalisation and a contribution to the economic development with job creation in regions where the group is present. Moreover, through our international expansion, Iberdrola opens the door for its suppliers and service providers to new markets and business.

The construction of this offshore wind farm in the Baltic Sea, where the water is between 37 and 43 m deep, requires an investment of €1400 million. The site covers a surface area of about 34 square kilometres (km²), where the company plans to install 70 wind turbines, each with a unit capacity of 5 MW [5].

Iberdrola is taking part in this initiative alongside the main offshore wind farm developers in order to reduce the costs of producing offshore wind power. Projects in this respect are being carried out throughout the supply chain. Work lines include production estimating, foundations, efficiency improvements in electricity transmission infrastructure and accessibility to perform maintenance tasks.

The offshore substation christened as 'Andalucía', now installed at its final location, will be the power core of the renewable energy facility. This electricity distribution infrastructure, which weighs some 8500 tonnes, will handle all electricity generated by the wind turbines operating in the open sea (see **Figure 7**).

By the time it is connected to the grid in late 2017, Wikinger's 350 MW capacity will produce enough energy to meet the electricity needs of over 350,000 German households, avoiding the emission of some 600,000 tonnes of CO₂ into the atmosphere each year [2] (see **Figure 8**).

With this general approach, we should highlight some of the innovation activities carried out in the Wikinger project [3]:

- Development of a numerical weather forecasting tool for planning installation work and operations.
- Implementation of an on-site pile test campaign at Wikinger wind farm aimed at validating (and optimising) the design of the jacket foundation piling (tasked with securing the foundations to the ground) due to the special characteristics of the seabed, with major improvements being achieved. In addition to validating the design, the project also seeks to develop new offshore testing procedures that can be applied to any terrain of



Figure 7. Substation 'Andalucia'.



Figure 8. Wikinger main project data.

uncertain characteristics by conducting a series of tests on calcareous ground. The conclusions drawn from the tests will be carried across to the development of new, more reliable design procedures.

- Design of a four-leg jacket foundation for the Wikinger project. The design of the foundation has been adapted to the site, and it has been optimised to simplify the fabrication process (see **Figure 9**).
- Innovative design of the offshore substation for the Wikinger wind farm that involves building it in two parts due to weight and size restrictions for transportation, along with its foundations on a six-leg jacket structure (see **Figure 10**).



Figure 9. 3D design of the Wikinger wind farm.



Figure 10. Wikinger wind farm pile test campaign.

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